

The

CHEMIST

June, 1961



DR. ALDEN EMERY — AIC Gold Medalist

(See Page 193)

Volume XXXVIII



Number 6

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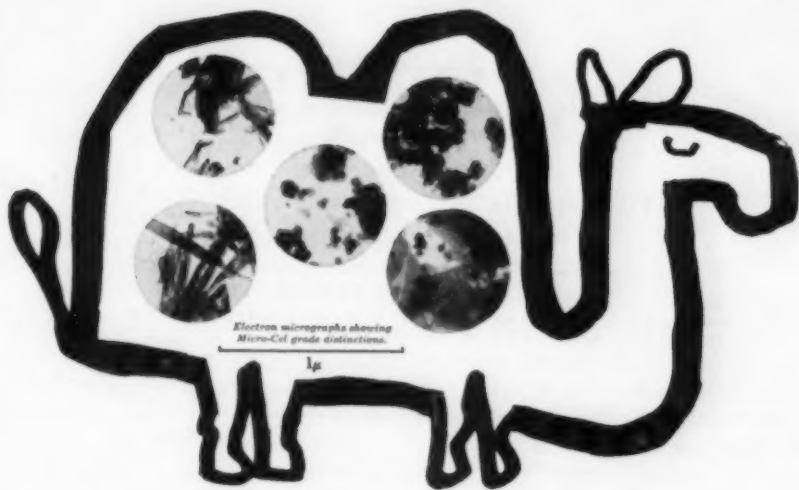
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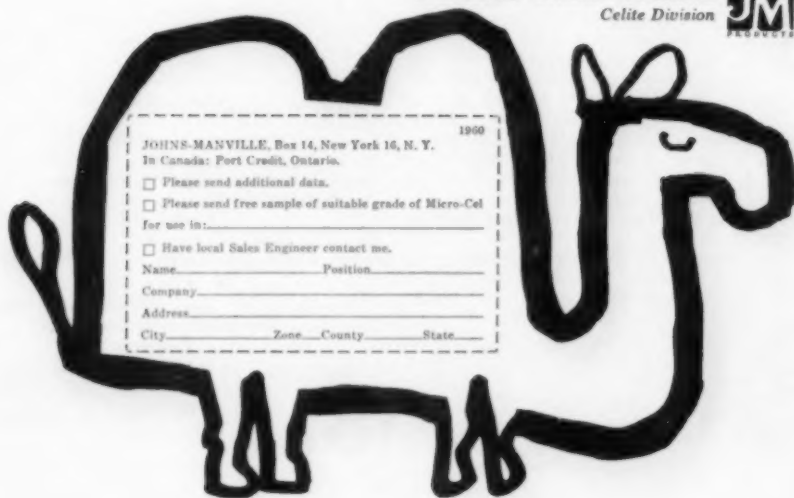


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To Come in July

The Hon. Maurice A. Crews, Assistant Commissioner of Patents, spoke on "Patents and the Patent Office as a Source of Technical Information," during the Patent Office tour taken by those attending the 38th Annual AIC Meeting. This paper and other information about the tour will appear . . . Dr. B. R. Stanerson, F.A.I.C., will present "The Ten Most Wanted Chemists." . . . The Hon. Richard S. Morse, Assistant Secretary of the Army (R & D), will discuss the "Impact of the Federal Scientific Research Program on Technological Progress." These papers were among those presented at the 38th Annual Meeting . . . Dr. L. T. Eby, F.A.I.C., who received the Honor Scroll of the New Jersey Chapter, April 19, offers some brief but significant remarks about the profession.

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The College Courses That Promote Success

AMONG the interesting reports presented at the 38th Annual AIC Meeting, May 11, was one that answers the question, "What are the most useful courses a student can take in college if he wants to build the best background for a successful career in the chemical industry?"

The report was presented by Karl M. Herstein and Dr. Donald B. Keyes. It was based on the first 70 replies received to the questionnaire on page 147 of the April *CHEMIST*. (Replies are still being received. Should they change the average figures given in the report, they will be published later.) This questionnaire asked AIC members in industry to select the lecture courses and the number of semesters in each course that would enable "your son to become more distinguished in the chemical industry than his father." The "course semesters" were not to exceed 40 for the 4 college years.

For comparison, the summary of the replies included a chemical engineering curriculum created by Prof. Charles L. Parsons fifty years ago in what is now the University of New Hampshire. In the analysis, quoted below, the main subjects are arranged in order of decreasing popularity based on the total semesters. Averages were obtained by dividing the total scores by 70, omitting anything below 1/2 semester. The total of the averages is 39. The total of the required courses at New Hampshire in 1911 was 42, a slightly heavier load than is given students today.

The main conclusion of the report was that if a young man will take the subjects indicated by the "Seventy" he will have an excellent educational base for whatever he may want to do later on in the chemical industry.

(See next page for this summary)

At the turn of the century in the U. S., only 7% of the total manufacturing work force was in the non-production category—scientists, engineers and highly trained technicians—while today the percentage is 24. The major portion of this gain was made in the past decade.

The 1961 Computer Applications Symposium sponsored by Armour Research Foundation will be held Oct. 25-26 at the Morrison Hotel, Chicago, Ill. For information: Benjamin Mittman, Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill.

**Statistical Summary of the Results From The
First Seventy Replies to the Questionnaire On
"What Courses are Needed for a Basic Chemical Training for Industry"**

SUBJECTS	Total Score	Average Number	N.H. 1911	SUBJECTS	Total Score	Average Number	N.H. 1911
1. <i>Chemistry</i>	754	11	15	Plant Design	39	1/2	
Organic	153	2	2	Eng. Econ.	31	1/2	
Physical	132	2	3	Eng. Controls	18		
Elementary	126	2	2	Eng. Math	16		
Quant. Anal.	67	1	4	7. <i>Economics</i>	74	1	
Qual. Anal.	57	1	1	General	48	1	
Instr. Anal.	49	1		Business Ec.	26		
Biochem.	42	1/2	1	8. <i>Thesis</i>	69	1	2
Ch. Thermo.	39	1/2		Chemistry	54	1	2
Ch. Kinetics	36	1/2		Chem. Eng.	15		
Ch. Lit.	28	1/2	2	9. <i>Business Mng.</i>	55	1	
Micro. Anal.	14			General	35	1	
History of Chem.	11			Accounting	20		
2. <i>Physics</i>	318	5	4	10. <i>Other Eng. Subjects</i>	42	1/2	3
Elementary	125	2	2	Mech. Eng.	17		1
Thermodynamics	55	1		Elec. Eng.	17		2
Electronics	45	1		Civil Eng., Etc.	8		
Solid State	43	1		11. <i>Appreciation</i>	31	1/2	
Mechanics	39	1	2	Music	19	1/2	
Other	11			Art	12		
3. <i>Foreign Languages</i>	290	4	4	Architecture	—		
German	142	2	4	12. <i>Miscellaneous</i>	285	4	7
Russian	99	1		Psychology	42	1	
French	46	1		Philosophy	40	1	1
Spanish	3			Biology	38	1/2	
4. <i>Mathematics</i>	296	4	4	Am. History	29	1/2	
Calculus	133	2	1	Bacteriology	27	1/2	
Adv. Algebra	66	1	1	European			
Diff. Equa.	64	1		History	27	1/2	
Other	33	1/2	2	Pol. Science	25		1
5. <i>English</i>	287	4	2	Sociology	18		
Composition	96	1	1	Machine Shop	11		
Report				Wood Shop	1		1
Writing	57	1		Surveying	1		1
Public				Other			
Speaking	55	1		Subjects	26*		3**
Literature	50	1					
Rhetoric	29		1				
6. <i>Chem. Eng.</i>	237	3	1				
Principles	93	1	1				
Ch. Eng.							
Thermo	40	1/2					

*Note: These included: Drafting, Adv. Inorganic Chem., Analytical Geom., Quantum Mechanics, Atomic Physics and Chemistry, Statistics, Eng. Material, Astronomy, Botany, Genetics, Geology, Metallurgy, Ind. Eng., Patents, "Guidance," Bus. Law, and the Bible.

**Note: These were two semesters of Drafting and one of Assaying.

Special AIC Announcements

Our New Officers

Dr. Johan Bjorksten, president of Bjorksten Research Foundation, Madison 1, Wisconsin, is our new president. He, as former president-elect, succeeded Dr. Milton Harris, whose term of office ended at the 38th Annual Meeting.

Dr. C. Harold Fisher, director, Southern Utilization Research & Development Division, ARS, U. S. Department of Agriculture, New Orleans, La., has been elected president-elect. He will succeed Dr. Bjorksten as our president in May 1962.

The new councilors-at-large, who will serve for three year terms, are: Dr. Henry B. Hass, consultant, Summit, N. J.; Dr. Lloyd H. Reyerson, professor of physical chemistry, University of Minnesota, Minneapolis, Minn., who was re-elected, and Martin B. Williams, chemist (rocket fuels research), Army Rocket & Guided Missile Agency, Redstone Arsenal, Alabama.

Dr. Jonassen Honored

The Honor Scroll of the Louisiana AIC Chapter was presented to Dr. Hans Boegh Jonassen, professor of chemistry, Tulane University, New Orleans, La., May 15, at the Tulane University Student Center. Dr. Jonassen was cited for "his influence on chemistry as a profession and on students of chemistry in the southern area."

Military Standby Reserves

Dr. Ed. J. Durham, chairman, presented, at the 38th Annual Meeting, the report of the Committee on Manpower, to the effect that those who are employers of scientists, engineers, and other critical manpower presently in the standby reserve, should review the status of these persons with the local draft boards, now, to have them placed in a less vulnerable classification. In the event of national emergency it would be too late to obtain reclassification and many would be available for immediate recall to military duty.

Honorary Membership Awards

Dr. W. George Parks, Hon. AIC, chairman of the Committee on Honorary Membership, has announced that Honorary AIC Membership will be presented, during the fiscal year 1961-62, to the following persons: Dr. James S. Coles, president, Bowdoin College, Brunswick, Maine; Karl M. Herstein, Life AIC, consultant, New York, N. Y.; Dr. John H. Nair, F.A.I.C., consultant, Summit, N. J.; Dr. Emil Ott, F.A.I.C., research specialist, Rutgers University, New Brunswick, N. J., and Dr. Lloyd H. Reyerson, F.A.I.C., professor of physical chemistry, University of Minnesota, Minneapolis, Minn.

Alabama Chapter Officers

The Alabama Chapter announces that the following officers will serve for the 1961-62 fiscal year:

Chairman, Oscar L. Hurtt, Jr. (re-elected), 405 South 85th St., Birmingham, Ala.

First Vice-chairman, Dr. Charles E. Feazel (re-elected), 827 Sims Ave., Birmingham 9, Ala.

Second Vice-chairman, William D. Guthrie (re-elected), 915 Speake Road, N.W., Huntsville, Ala.

Secretary, Robert E. Lacey (re-elected), 414 Kenilworth Drive, Birmingham, Ala.

Treasurer, Everett L. Huffman, 12 Edgehill Road, Birmingham 9, Ala.

National Council Representative, Dr. Robert W. Walker, Rohm & Haas Co., Huntsville, Ala.

New Officers for Florida Chapter

The Florida Chapter has elected the following officers for the fiscal year 1961-62:

Chairman, Dr. Armin H. Gropp, 1715 N.W. 10th Terrace, Gainesville, Fla.

Chairman-elect, Robert A. Nanz, Florida Chemists & Engineers, Inc., 645 Rugby Ave., Orlando, Fla.

Secretary, D. H. Killeffer, P.O. Box 443, Clearwater, Fla.

Treasurer, Dr. Vlon N. Morris (re-elected), 1095 Druid Drive, Maitland, Fla.

National Council Representative, Dr. Everette M. Burdick, 4821 Ronda St., Coral Gables, Fla.

To All Councilors

A meeting of the AIC Board of Directors and the National Council will be held on Monday, June 5, 1961, at The Chemists' Club, 52 East 41st St., New York, N. Y. The Board will meet at 4:30 p.m., the Council at 5:50 p.m.

New Jersey Chapter Elections

The following officers were elected by the New Jersey Chapter for the coming fiscal year:

Chairman, Dr. Frederick A. Lowenheim, 637 West 7th St., Plainfield, N. J.

Chairman-elect, Prof. Stephen E. Ulrich, 31 Bedford Road, New Brunswick, N. J.

Secretary, Oliver E. Sheffield, P.O. Box 327, Dover, N. J.

Treasurer (re-elected), Dr. Curt Bamberger, 382 - 17th Ave., Paterson 4, N. J.

National Council Representative, Dr. John F. Mahoney, 1000 Woodmere Drive, Westfield, N. J.

Chapter Councilors (2 year terms), Dr. Harold R. McCleary, Dr. Edgar E. Lineken, Dr. Fred J. Gajewski, Dr. Anthony C. Shabica, and Dr. I. Kirshenbaum.

About Our Election

Nomination ballots were cast by 1163 of our 2904 members. Election ballots were cast by 937 members. The ballots were counted by Richard H. Fairbanks, Sr., F.A.I.C., and Max E. Baker, M.A.I.C., assisted by Miss Jeanette Oprava. We are grateful to these tellers for their contribution of personal time to this essential task.

The American Rocket Society and Northwestern University announce the Fourth Biennial Gas Dynamics Symposium, to be held at Northwestern University, Evanston, Ill., Aug. 23-25, 1961. For information: Gas Dynamics Symposium, Mechanical Engineering Dept., at the university.

The Road to Professional Status

Dr. Alden H. Emery, Hon. AIC

Executive Secretary, American Chemical Society

(Address accepting the AIC Gold Medal, presented May 11, 1961, in Washington, D.C.)

IT is not difficult to define a profession. Several such statements are quoted but probably none as often as the 1912 pronouncement of Justice Brandeis. It provides the setting for what follows. According to Justice Brandeis, the peculiar characteristics of a profession are these:

First: A profession is an occupation for which the necessary preliminary training is intellectual in character, involving knowledge and to some extent learning as distinguished from mere skill.

Second: It is an occupation which is pursued largely for others and not merely for one's self.

Third: It is an occupation in which the amount of financial return is not the accepted measure of success.

Such widely different fields as the ministry, law, medicine, and chemistry meet the foregoing requirements. The courts have declared that chemistry is a profession. Many who practice chemistry consider themselves professionals and are so considered by their colleagues and friends. This does not mean, however, that every person who graduates with a major in chemistry is a true professional, automatically entitled to something called professional status. To be a professional man requires a certain minimum training in a designated field, but also it demands a *lot more*. The fact that being a chemist does not make that man a professional is the root from which stem many of the professional activities of The American Institute of Chemists and the American Chemical Society.

We have mentioned chemistry—the profession, and chemists—the professionals. The third element, the one which today seems to get the most attention, is professional status. Just what do we mean by it? As I listen to discussions of this topic, I am struck by the lack of consistency of desires, their departure from the definition of a profession and even from the status of old and respected professions. On the average, high financial return accrues to members of certain professions, but, not to the ministry. Furthermore, even in a calling high on the economic ladder, some of its followers may have incomes far below the popular concept for that field. Chemists tend to make financial comparisons with doctors of medicine and use the results to measure status. Probably every one who does so in a complaining manner receives more financial income than Albert Schweitzer, the late Tom Dooley, and many other MD's. But who dares say that the Schweitzers and the country doctors are not professional and do not have status? I do not minimize the importance of adequate income nor do I

object to efforts to improve the economic position of chemists who are true professionals. I object strongly to considering this as a *prime factor* in professional status, even as the measure of achievement of status, and call attention to the often overlooked third item in the Brandeis definition.

We seem to look enviously at the lot in life of certain members of other professions, mainly those who are more successful. Apparently we want for all chemists a combination of the best aspects of a variety of professions. In so doing, however, it is easy to ignore significant factors involved in these fields which are not applicable to us. For example, persons in certain occupations enjoy direct contact with the public which contributes immeasurably to wide-spread understanding of their work. No public relations program, no matter how well done, can be as effective as the personal friendship of each citizen with "Doc," for example. Also, a profession which is largely self-employed has greater control of its economic status than does our own in which most practitioners are salaried.

While there is a common denominator for professions, there are wide differences in the way they are practiced and that makes it illogical to expect the status symbols of one to accrue to all. *Have we ever examined our own profession*, without envious comparison with certain others, and *determined what status symbols are reasonable and proper?* Is our current struggle perhaps caused simply by dissatisfaction but without any clear idea of what is realistic or attainable? Have we really calmly and deliberately thought about what status symbols we need to give us professional pride and presumably make us more productive?

The excellent study made for the ACS by Social Research, Inc., on "Chemists' Views of their Professional Status" makes amply clear that we are dealing here with an extremely involved matter. There is no unanimity of thought on what constitutes proper status. Opinions on present status, however defined, vary significantly for academic and for industrial employees. They differ among kinds of jobs and among varying academic backgrounds. It is clear that there is no one goal, or even a limited number of goals, which, if reached, would constitute for the profession as a whole the status they seek. Thus, we must realize that in all generalized discussions of professional status, the image existing in the minds of those commenting varies widely. Concurrence is more philosophical than real, more an endorsement of individual and perhaps unexpressed desires than of specific programs. In other words, an undefined and widely different goal is endorsed, but the man who carries the ball to his goal may not register a score for another.

THE ROAD TO PROFESSIONAL STATUS

Admitting that semantics are involved, we face three steps: training in a profession, being a professional man, and achieving professional status. Progression through this sequence is not automatic. Being a chemist is only the first step toward being a professional. Being a *true* professional automatically brings status to most. Not everyone trained in a recognized profession can have, nor does he always deserve, professional status. In my opinion, too many persons with the necessary training expect to gain professional status automatically and immediately without first becoming professionals through thinking and acting like professionals. This is wholly unrealistic.

Professionalism to me primarily is an attitude of mind that dictates a form of unselfish living and full utilization of one's talents, especially to benefit society and without primary regard to personal aggrandizement. To achieve such an aim provides personal satisfactions that mean more than money to most professionals.

You can not make *me* a professional. I can become one only if there is something within me which drives me to work in some way for the good of mankind or some segment thereof. Group action can provide a road map that leads toward professionalism but professionalism must be earned individually. The status so greatly desired by many seems to flow with little or no personal effort to those who are truly professional.

If one accepts the foregoing, and many will not, perhaps in some of our efforts we are putting the cart before the horse. It seems to me that, in the end, we will contribute significantly to status first through better training in our field and next in building among the members of our profession better recognition of proper professional attitudes. All the evidences of status desired may not flow from this, but many will come without substantial organized effort and those which don't can be obtained more readily.

My insistence upon the primary responsibility of the individual chemist for professional status does not mean that he can look for no help from his fellow chemists in The American Institute of Chemists and the American Chemical Society. On the contrary, there are many ways in which we can give the individual valuable assistance.

First of all, we can continue and expand our efforts to assure that those entering our profession receive sound training and have ample opportunity for continuing self-education throughout their careers. Activities in this area obviously can be carried out more effectively through organized

programs than through individual effort—although even here individual effort is needed.

Second, each of us can be a living example of a true professional. This means more than comporting one's self as a professional at all times; it means giving attention to the problems of the profession and working, through organizations such as the AIC and the ACS, to solve them.

Third, we can do our utmost to create a climate favorable to the development of professional attitudes among our associates. The meetings and publications of the AIC and the ACS are important here, as is the influence of these organizations on the attitudes of employers. I'll admit that employers have a responsibility, too, but ours comes first.

However, even if we create such a climate, it does not and cannot make every person who lives in that climate a professional. Let's forget that chemistry is recognized legally as a profession. That's only a starting point. Let's minimize the emphasis on the evidences of professionalism which are called professional status. These are likely to flow to men of accomplishment in any skilled field. Let's dig deeper. Let's not overlook the second point in the definition to which I am talking: "It is an occupation which is pursued largely for others and not merely for one's self." Let's concentrate on developing in those trained in our field an emphasis on service to mankind, a true professional attitude. For the AIC and ACS this is perhaps our most important and challenging responsibility. And whatever we do, always remember that there is no short cut to professional status.

All of this represents what we must do for and among ourselves. In addition, it is proper to work for greater public recognition, to create a climate favorable to the development of our profession and to the proper recognition of professional attainment if first we assure that we *genuinely merit such recognition*. The Social Research survey mentioned earlier showed that, among possible ACS activities to raise professional status, the most popular by far with the respondents was a continuing effort to obtain greater public recognition of the important contributions made by chemists and chemical engineers.

In all our activities, whatever they may be, let's observe priorities and be careful of our semantics. Priority Number 1 is to assure sound education and Number 2 is to develop proper professional mentality and attitudes. Along with this we should protect the professional nature of our field of work. This order should not be reversed or we are working for nothing

THE ROAD TO PROFESSIONAL STATUS

more than "fringe benefits" that may or may not be deserved and possibly will be given grudgingly.

As I observe efforts to promote the professional status of chemists, it seems to me that too much time and energy are being given to the fringes and too little to the *core* of the problem. This is understandable—it's easier to reach the fringes than the heart of any matter. It's far simpler to change practices or seek legislation than it is to change human nature. But, we are not ourselves worthy to be called professionals if we shun the most difficult, if we dodge the basic matters in favor of the decorations. Group action does not in itself *give* professional status. It only affects the climate in which we work and should help us to *earn* professional status.

Since I have stressed the importance of professionalism, it is logical to ask how we can teach the elementary facts to students and advanced aspects to young chemists in their first employment. Frankly, in my opinion it is just as impossible to teach professionalism as it is to teach honesty and morals. A child absorbs moral viewpoints from his parents, has them reinforced or lessened by his teachers and school associates, and gets a post-graduate course at some level down to *immorals* from his associates after employment. Much the same pattern exists for professional attitudes except that the "parental" influence by example usually comes during college and university training. The post-graduate work is supplied by associates in employment. What is required is that all of us live and act as professionals at all times and teach by example, emphasized as need be by personal discussions, not lectures. I believe that this aspect of training needs strengthening.

In 1957, I concluded a talk on "Professional Attitudes" with the following comment, which reflects my views today as accurately as it did then and, therefore, is a proper closing. I said:

Do we know why we want professional recognition? Many of those seeking professional status are thinking of such recognition as bringing high financial returns, but it hasn't had this result for the ministry. Many are thinking of it as resulting in an easier way of life, but professional recognition has not given this to the medical doctor. Many are thinking of it as a class distinction, classification on a high plane with great respect from the public, and this it is. The public grants this recognition because by any of the many and varied definitions, a profession involves extensive education, predominantly mental as contrasted with physical, and results in broad benefits to the public. It grants the recognition not because some

court has declared that chemistry is a profession but because the chemists it knows act in accordance with the principles expected of the members of a profession.

If chemists and chemical engineers want to be recognized as professional men, they must act like professional men, they must think like professional men, they must constantly grow in mental stature, they must merit the recognition.

Let's face it—It's a tough job, a continuing job, to deserve professional recognition, but it's well worth it!

(See page 229 for the Medal presentation to Dr. Emery)

Professional Program Repeated

The "open end" panel program on "The Working Chemist and Professionalism," reported by Dr. Max Bender, F.A.I.C., in the Feb. 1961 issue of *THE CHEMIST*, which was given at Fairleigh Dickinson University, Madison, N. J. at a meeting of the Lackawanna Subsection of the North Jersey section, A.C.S., was repeated on Jan. 18, at a meeting of the Delaware Section of the ACS in Wilmington, Del. At this latter meeting the panel consisted of Dr. Max Bender, F.A.I.C., of American Cyanamid Co., Bound Brook, N. J.; Dr. Simon Marcuson, professor of industrial relations, Princeton University; Dr. William Rieman, III, F.A.I.C., professor of chemistry, Rutgers State University; Dr. B. R. Stanerson, F.A.I.C., deputy executive secretary, ACS, and Dr. J. Nelson Tully, Du Pont Personnel Relations Department.

The 18th International Congress of Pure & Applied Chemistry will be held at Montreal, Canada, Aug. 6-12. For information: The Secretary, 18th Int. Congress of Pure & Applied Chem., National Research Council, Ottawa, Canada.

The International Instrument-Automation Conference & Exhibit program will be presented by the Instrument Society of America in Toronto, Canada, June 5-8, 1961. Request information from the Society at 313 6th Ave., Pittsburgh 22, Pa.

The National Society of Professional Engineers, 2029 K. St., N.W., Washington 6, D.C. will hold its 27th annual meeting, July 4-7, at the Olympic Hotel, Seattle, Washington.

The trustees announce the appointment of Dr. Richard Franklin Humphreys as president of The Cooper Union for the Advancement of Science and Art, New York 3, N. Y.

Washington, the Science Information Center of the Nation

C. D. Gull

Consulting Analyst, Information Processing, Defense Electronics Division,
General Electric Co., 4901 Fairmont Ave., Washington 14, D.C.

(Remarks introducing the First Professional Session, May 11, 1961, at the 38th Annual AIC Meeting in Washington, D.C.)

THOSE of us who live in Washington are convinced that Washington is the science information center of the nation. When considered from the point of view of the chemist, this assertion can be contrasted with the remarkable publications of the Chemical Abstracts Service of the American Chemical Society, from Columbus, *Chemical Abstracts* and the new *Chemical Titles*. These publications are keys to the journal literature. Is there more information in Washington than these publications unlock for the chemist? My conclusion is that there is.

In support of this conclusion, I turned to the 6th Edition, 1959, of *Library & Reference Facilities in the Area of the District of Columbia*, published by the Loan Division of the Library of Congress. There are 244 libraries listed there. A rough addition yields a total of 26,000,000 volumes in those libraries; I made no effort to ascertain the proportion of books to bound periodicals nor how many pamphlets, reports, microforms, and other materials there may be in these libraries. The index under chemistry reveals fine chemical collections, ranging from the strong general collection in the Department

of Agriculture Library, to the specialized collection on textile chemistry in the Harris Research Laboratories. Some 20 libraries were listed. Strangely enough, the index did not reveal the remarkable collections in the Library of Congress, in the Smithsonian Institution, and in the Patent Office; and a library-by-library inspection turned up about 20 notable chemical collections not revealed because chemistry was encompassed under the broader term of science, in the index. We may conclude that the library resources for chemistry are indeed great in Washington.

The report literature is not easily accessible through these libraries; yet the moving frontier of chemistry, as other sciences and technologies, is to be found in the report literature which results from the \$9-billion to \$12-billion spent each year on R & D in this country. Most of this expenditure comes from the Federal Government and the reports are returned to the Government as well as sent out to selected addresses. The guide revealed the Office of Technical Services in the Department of Commerce, which is charged with distributing the unclassified scientific and technical literature to the general public;

but it did not show the Armed Services Technical Information Agency, which performs the same operation for security classified as well as unclassified reports for the Federal Government and for Defense Department contractors.

There are four other items indispensable to the person who uses Washington as the science information center of the nation. Three of these are in book form; the fourth is the telephone. The *Congressional Directory* contains a great deal of information about both the legislative and executive branches of the Government, as does the *U. S. Government Organization Manual*. These are updated frequently and can be purchased from the Government Printing Office. They complement one another and are indispensable in any effective use of Washington as the science information center of the nation. Their efficient use will permit an individual to gain access to persons in Washington who possess professional understanding and specialized knowledge of scientific and technical subjects. The alphabetic part of the *Washington Metropolitan Area Telephone Directory* is the key to getting from the two Government directories to the individuals by telephone.

The conclusion is that, in addition to the activities which attempt to control and service scientific and technical information in Washing-

ton, the really effective method to gain access to the treasures of information in Washington is to consult the people who know the subject matter.

(The following three papers, presented by the speakers at this professional session, describe the efforts under way to supplement personal contacts with better information control and suggest that even more effective measures are needed.)

Merck Sharp & Dohme International, division of Merck & Co., Inc., Rahway, N. J., and Laboratoires Delagrangé, French pharmaceutical company, have acquired joint ownership of all shares of Synorga S.A. of Chenove, France, which will be renamed Compagnie Chimique Merck Sharp & Dohme S.A. They are also establishing a new, jointly owned, pharmaceutical company in Paris to be known as Laboratoires Merck Sharp & Dohme S.A.

The Emil Greiner Co. of New York has announced the appointment of Albert Alperin as director of purchases.

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Chemical Information and the Role of the National Science Foundation

Dr. Burton W. Adkinson

Director of the Office of Science Information Service,
National Science Foundation, Washington, D.C.

(Condensation of a paper presented at the 38th Annual Meeting of the AIC in Washington, D.C., May 11, 1961.)

I shall discuss the scientific information programs of the National Science Foundation and how these programs relate to you as members of the chemistry profession. The primary mission of the NSF is to serve as the Federal Government's mechanism for furthering the nation's basic research. In keeping with this primary mission, the NSF has been assigned broad responsibility for improving the availability of scientific and technical information.

From the time of its establishment in 1950, until 1959, the NSF provided support to scientific information activities to the extent that its limited financial allocation would allow. However, in 1958, both the Congress and the Executive Branch of the Government directed attention to the serious inadequacies in this nation's ability to handle the scientific information which was generated by the greatly expanding R & D programs of the U. S. and other countries, and the adverse effect this could have on our future scientific progress. Various facets of the scientific information problem and alternative approaches to improve the situation were considered. The conclusion was that the Government could best improve the availability of scientific information by developing a coordinated but decentralized network of scientific information activities, strengthening existing information activities wherever possible. Considerations which led to this conclusion bear special emphasis. First it was concluded that the problem was far too large for any one organization to handle, let alone solve. Second, it was believed that to be effective and to conform with the traditions of American science, the responsibility for the affairs of science, including the management of scientific information, must rest with the scientist and his own organizations.

Late in 1958, the President approved a plan proposed by his Science Advisory Committee for the coordination of scientific information activities on a nation-wide basis. An amendment to Executive Order 10521 assigned responsibility for the implementation of this plan to the NSF. Just previously, Congress had passed the National Defense Education act of 1958, which charged the NSF with responsibilities paralleling the recommendations of the President's Science Advisory Committee. Under this

Act, the Foundation was directed to establish a Science Information Service which would (1) provide, or arrange for the provision of, indexing, abstracting, translating, and other services leading to a more effective dissemination of scientific information, and (2) undertake programs to develop new or improved methods, including mechanized systems, for making scientific information available.

On the basis of these two directives, NSF's role is to work with the individuals, societies, and the organizations comprising the scientific and technical community in the improvement of their own scientific information activities. Congress appropriates annually a limited amount of money which NSF may allocate through grants or contracts to stimulate projects essential to this improvement program. A part of this responsibility is concerned with improving the entire national scientific information system, through working with, and improving coordination among, all of the various R & D organizations, professional groups, government agencies and private organizations involved with scientific information. In addition our responsibility also involves us in the information activities of the various scientific disciplines, such as chemistry. In such cases, the role of the NSF is that of working as a partner with the scientific group involved.

The Nature of NSF Information Activities

Let us review briefly what the NSF, working with the chemistry community, has been doing. The NSF makes available several hundred thousand dollars for travel of U. S. scientists to International Meetings held outside the U. S. In 1960, 703 scientists, including about 100 chemists, were thus assisted.

NSF has devoted a major part of its effort to improving the availability of the scientific books, journals and indexing and abstracting publications which have long been the backbone of scientific communication. This involves keeping the current system of publications operating by providing temporary financial assistance. Important journals, experiencing temporary financial difficulty, must be kept from failing. NSF support has permitted (a) the *Journal of Chemical Physics* to publish its backlog of papers, and (b) the *Journal of Chemical Education* to prepare its 10-year index. Important monographs which have limited sales potential must be published. NSF grants made possible the publication of several important handbooks and monographs, such as (a) *The Physical Chemistry of Silicates*, (b) the *Tables of Physico-chemical Constants of Binary Systems in Concentrated Solutions*, and (c) a monograph on the chemistry and bio-chemistry of lignan. As an adjunct to our temporary aid, we are cooperating with

scientific societies in a search for permanent solutions to some of the economic and technical problems confronting our scientific publishers.

We are also studying and supporting the development of experimental publication forms and techniques. A NSF grant was made to the *Chemical Abstracts Service* to permit the experimental publication of the KWIC index of *Chemical Titles* which was introduced last year. This KWIC index is prepared mechanically by permuting and then alphabetizing the significant words in the titles of chemical papers. It represents just one approach to overcoming the long delay in the appearance of indexes to chemical abstracts, thus satisfying the needs of chemists for current information about new literature. A grant was also made to the Thermophysical Properties Research Center at Purdue University to permit an "Analytical and Experimental Study of a Method for Literature Search in Abstracting Journals."

The NSF is also directing attention to the rapidly growing multitude of specialized information services and centers. There is a trend towards the establishment of highly specialized information service activities which cover specific subjects and offer highly specialized services to small fragments of the scientific community. This trend may be indicative of the direction of future development. We are examining the various types of data centers, information centers, regional centers and other non-conventional services which are developing. We have contracted with Battelle Memorial Institute to conduct a survey to locate all of the specialized scientific information services in the U. S., and we plan to publish a directory of these services.

Wherever possible we are encouraging experimental forms of information services. Under NSF grant, Southern Methodist University, while currently examining the feasibility of establishing a regional scientific information center for the Southwestern U. S., is developing a methodology for use by other organizations with similar information problems. Long-term support from NSF is permitting the National Academy of Sciences to coordinate and stimulate the publication of critical data in a program designed to take the place of the *International Critical Tables*, which were last published in 1933.

Chemical Abstracts Service with some NSF support, has undertaken a mechanization program intended to find ways in which machine techniques can be applied to CA operations to improve existing indexing and abstracting services as well as to permit CA to provide new services. Some of the new forms of service being considered are information retrieval

services in response to user requests and the systematic retrieval of data to facilitate the preparation of monographs and reviews.

Coordination of Government Information Activities

The extensive involvement of the Government in science and the divergent activities and policies of the various agencies make the Government an area where special attention must be given to the coordination of scientific information programs. NSF is examining current activities within the Federal structure and is beginning to identify areas for improvement. As a part of this effort, NSF is sponsoring an inventory of scientific information activities of all Government agencies. Publication of some 50 bulletins describing these activities is underway. Of particular concern are the special problems associated with the Government report literature as a source of scientific information. Plans are underway to establish a network of regional report reference centers to improve the availability of unclassified Government research reports.

Since we are concerned with the future of documentation, one of our primary objectives has been to plan, coordinate, and sponsor research for the development of new documentation techniques and equipment. Efforts have been directed toward the study of problems such as the mechanization of information storage and search, the mechanical translation of foreign languages, the development and evaluation of indexing systems and the coding of scientific information. Satisfactory schemes for coding information and representing chemical formulae must be developed before mechanization can be achieved. The NSF has supported a number of studies concerned with various chemical coding and notation systems. One such study is the comparison of the Dyson and Wiswesser notation systems; another will permit comparison of all current chemical notation systems by an NAS committee.

Another important area is that of developing mechanical translation systems. Two such major mechanical translation research projects are being supported by NSF grants; one in organic chemistry at Harvard, another in bio-chemistry at the University of California.

Our program is also concerned with studies of the users' needs, the study of semantics, and a host of other projects designed to increase the basic understanding of documentation and communication processes. (a) Under NSF grant, Columbia University recently completed a critical review of the numerous user studies which have been made. (b) NSF also supported a recent operations research study at Case Institute of Technology which investigated the reading practices of chemists. (c) Un-

der NSF grant, Chemical Abstracts Service is conducting a research program on such matters as the semantics of chemical literature and the content analysis of this literature.

Improving the Availability of Foreign Information

Another major effort is concerned with scientific information generated in other countries. Grants are made to translate important scientific information and to make it available. The NSF support has provided U. S. chemists with an English translation of such important Soviet journals as the Russian *Journal of General Chemistry* and *Journal of Applied Chemistry*. We are working with the AIChE to set up a program for the selective translation of chemical engineering literature originating in the Communist Bloc countries. To make scarce foreign material available, the NSF has given support to the Midwest Inter-Library Center in Chicago, a cooperative organization of 19 major midwestern university libraries, to acquire all "hard-to-get" foreign journals in chemistry and biology which are covered by *Chemical Abstracts*.

NSF encourages the coordination of the acquisitioning and translating efforts in this country. (a) NSF coordinates for all Federal agencies the translation of documents under the Public Law 480 Program. Under this law, financial credit accruing to the U. S. in foreign countries as a result of agricultural trade agreements can be utilized for research and the translation of documents. This program is currently supporting translation programs in such countries as Yugoslavia, Israel, and Poland, and thus adds to the limited translating capacity of the U. S. The program has effected the translation of 8000 pages of foreign chemical literature. (b) NSF also stimulated the interagency cooperation which led to the establishment of the Foreign Technical Information Center in the OTS, Department of Commerce. This OTS project and the Special Libraries Translation Center at the John Crerar Library in Chicago, which NSF supports, serve as clearinghouses for all available translated scientific information.

In addition, NSF is supporting studies of the scientific activities of various foreign countries to identify new source areas where specific type of information should be sought. We are working with the ACS and other organizations to determine the foreign information needs of U. S. scientists.

The Nature of Program Activities

The NSF support of several research, mechanization, and experimental publication projects at the Chemical Abstracts Service comprises a broad plan of study and improvement underway at CA. *Chemical Abstracts*

has long been a major factor which has made the organization of the chemical literature among the best in the scientific community. Their current development program reflects that the scientific information problem cannot be solved merely by enlarging present activities. The problem must be completely reviewed in the context of present and future circumstances and totally new solutions must be sought.

It is estimated that NSF has provided over \$2-million to information projects directly concerned with chemistry . . . Considering all that has been accomplished, much of the necessary background work has been done and a foundation is being laid for truly significant improvements in the handling of scientific information. The scientific community is now on the brink of a period in which great improvement to its information activities is possible; a period where recording, organization, and dissemination of scientific information may be accomplished by revolutionary techniques. It is being forced upon us by the press of a shrinking time cycle of research-to-development and a mounting volume of scientific research . . . It is also being made possible by the advances in information technology in such fields as electronics, computers, audiovisual systems, and facsimile transmission.

We have not yet committed ourselves to what such a period requires. It requires a willingness to re-think the entire information problem in view of present and future circumstances, and to surrender traditional methods and concepts where necessary. It requires unselfish cooperation among the organizations involved. It requires more participation and involvement by every scientific worker. This period is charged by a sense of urgency. The widening gap between the amount of scientific R & D underway and our ability to handle the resulting information has been serious for some time. This gap could critically widen unless we plan farther ahead. But the dissemination and utilization of scientific information only makes sense when it is considered to be an integral part of the R & D process. Under such conditions, the timing and accuracy of planning are imperative.

The Role of the Individual Scientist

In discussions of broad planning and major projects, there is a tendency to overlook or obscure the role of the individual. I shall emphasize some of the areas where the role of the individual is of utmost importance. In the dissemination of scientific information we are dealing with human systems, in which the limitations, characteristics and needs of the individual producer and user of information are the dominant factors. In these systems, the countless originators of scientific information are linked to the

ultimate users by intermediary service activities, such as scientific meetings, publications, abstracting services, libraries and the like. These services exist for only one purpose, to serve the user scientist. The determination of whether these services are adequate and how they may be improved depends upon the satisfaction and support of the user. The responsibility rests with every user to objectively evaluate these information services. The organization serving the user depends upon this support to measure their success.

It is essential that the individual continue to represent and define his own information needs. As the field of scientific information becomes more complex there is a tendency for individual scientists to cast off their participation and rely on the documentation specialist or librarian. These specialists cannot define the scientist's own information needs nor can they assume his professional responsibility regarding the use of that information.

On those of us in managerial capacities rests another responsibility: to continually appraise the information policies of our own organization to insure that we are managing these information resources well and that we are making the maximum contribution to the fund of scientific knowledge. It is incumbent on us all to think about these relationships of scientific information to our profession and to act in support of our conclusions. What the role of the NSF in chemical information will be in the future remains for you in the chemistry profession to determine. The chemistry profession shares with the Foundation any success we have had or will have in the improved dissemination of chemical information. We at NSF look forward to a future of continued harmonious and effective cooperation with you and your organizations.

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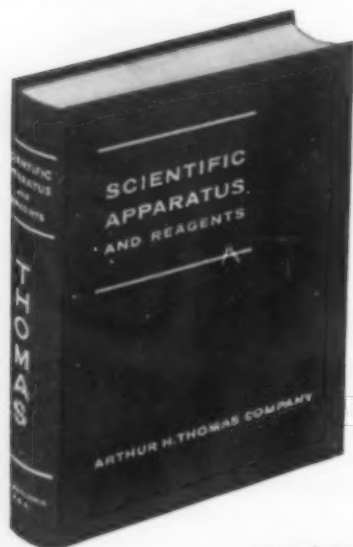
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The American Institute of Chemical Engineers, 25 West 45th St., New York 36, N. Y., announces that a new quarterly journal, to contain translations of chemical engineering work being done in Russia, Eastern and Central Europe, and China, will begin publication in October, 1961. Waldo Hoffman is editor.

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Communicating Research Results to Science and Industry

John C. Green

Director of the Office of Technical Services, Business & Defense Services Administration,
U. S. Department of Commerce, Washington, D.C.

(A paper, here slightly condensed, presented at the 38th AIC Annual Meeting, in
Washington, D.C., May 11, 1961).

MANY U. S. companies have effective information, collection, and analysis systems, but far too many still rely on the librarian to collect suitable information and store it against the day when the scientist or engineer may come to the library and seek it out. Yet a recent survey, supported by Dr. B. W. Adkinson, shows that many scientists and engineers rarely visit the library at all. Apparently a majority rely on the reading habits they acquire in college to keep them abreast of scientific developments. I would like to acquaint you with the emerging role of the Federal Government in scientific and technical information.

Roughly \$9-billion or about 1/12 of the entire Federal budget is allocated to the support of research and development. The end product of research is a written report. Thus this massive sponsorship of science is producing many thousands of studies. The interest in research is divided within the Federal community, yet Defense, AEC, and NASA finance over 90% of the total effort. These agencies demand the research information in order to advance their missions. However, knowledge is not limited in application. Thus there are valuable by-products of information which can contribute to economic growth and stability, if they are communicated to those in industry who can perceive their applications.

What are the mechanisms of communication within the Federal Government? Like other public and private information services they are multiple; yet they are not difficult to learn. First, each agency supporting science has an internal information service designed to keep its personnel and those in the scientific community with which it is working well informed. For example, the AEC has an excellent information network operating out of Oak Ridge through which university grantees and industry contractors are provided the results of research relating to their interests. The NASA is setting up an information program and since many of their key information personnel were recruited from AEC, I suspect they will provide a comparable service.

The Military have found it necessary to set up two mechanisms identified as primary and secondary distribution. Under the first, the contract

agency provides the research institute with a list of names and concerns who should receive research reports immediately upon completion. This technique insures that those who are working in the same field as contractors or grantees are informed of new developments promptly. Second, distribution is handled by a large central information unit known as the Armed Services Technical Information Agency. This unit obtains copies of classified and unclassified military research project reports and provides an excellent service to those "with a need to know." If your company is engaged in R & D for the military and you are not taking advantage of ASTIA's services, I urge you to do so. It is now cataloging, announcing, and supplying copies of nearly 30,000 titles a year covering research.

If you want to take advantage of government research in connection with your own interests or your company's private objectives, the Office of Technical Services is prepared to respond to your needs. Our program was established by law to collect, catalog, reproduce and distribute research reports growing out of government research—to serve the public as a central point in the government from which private firms, organizations, and individuals could get reports of research conducted by the Army, Navy, Air Force, AEC and other Federal agencies.

We began at the close of World War II when two important jobs had to be done. First, the Allied Forces were occupying the Axis Nations and had access to many documents detailing important German wartime research. If these facts were systematically organized and distributed, they could speed the transition from a war to a peace economy. Second, our nation had many new scientific and technical developments through the urgency of wartime research which were kept secret during the War but thereafter should be released for the benefit of science and industry. To accomplish these objectives, the office was created by two executive orders signed by President Truman. Our name was then the Publication Board, it is now the Office of Technical Services. Our immediate job was to organize, catalog, reproduce, and distribute the technical papers captured in enemy nations and also to work with the military departments in the declassification and distribution of World War II reports of U. S. Government R & D.

In 1945, few scientists or administrators anticipated that our Government would undertake again a volume of research work comparable to that accomplished during World War II. Instead we expected a transition to a pre-World War II atmosphere with a shrinking in Federal attention to science. However, events did not work out that way and this year our

COMMUNICATING RESEARCH RESULTS . . .

Government is financing over five times as much research as it did during the peak year, 1945. A dollar today does not buy what it did in 1945, but taking this into consideration, the \$9.1-billion worth of research to be accomplished by the Government this year will result in a much larger volume of end product than came out of the \$1.6-billion spent in 1945. It is the job of OTS to collect the unclassified results of this research, catalog them, notify you of their availability, and supply you with reproductions . . .

We have kept pace with the annual growth in Government research, although we have had difficulties in providing personnel and facilities. The Congress in 1950 recognized that the nation was going to have big Federal R & D budgets for many years and that a program to put their results into the hands of private firms was an important part of our national investment in science. Therefore, our assignment was given permanent status by Public Law 776 of the 81st Congress. Our progress since then is shown by statistics for the past 5 years in which the number of titles offered to the public has doubled and sales of copies have increased over 300%.

We have a unique feature in our operation, prescribed by both the executive orders and the Congress. Our reproduction program is self-supporting. When you get a report from OTS, you pay the actual cost of reproducing and distributing that document. Last year, we sold almost 500,000 copies of R & D reports for over half a million dollars. This method of operation is a good one. It saves the taxpayers, who have already paid for the research, the additional cost of distributing research reports to private industry. The customers pay for the service, yet it would be difficult to find a better "bargain basement" in which to shop than the OTS collection. For a dollar or two one can buy the results of a research project that cost many thousands. We have "case histories" of savings of thousands of dollars, by avoiding duplication of research already done, and of returns resulting from use of information to develop a new product or to introduce a cost-saving process.

About one-third of the material collected by OTS is in the field of chemistry. The areas in which government research dollars are spent are determined by the necessities of national defense and not as efforts to aid particular industries. Since chemistry is a field currently calling for a large scientific and technological push, many of you find more reports available from OTS in your field than do scientists and engineers in some other areas.

The materials range from the most specialized type of study on an individual chemical compound to the "far out" report of progress along some long road which eventually will lead to a new development to change our lives: For example, a recent report summarized the unclassified results of military research on development of the fuel cell. This is the second *Annual Status Report* issued by the Department of the Army. Reporting the work of all the services, it states that work on fuel cells has increased greatly the past year, but the remaining problems to be solved are great. Among the major goals to be achieved are direct electrochemical conversion of hydrocarbons and indirect use of coal. The cost of this report is 75 cents. OTS is more than an outlet for military research. We are, for example, the agency through which all the R & D reports of the AEC and the Office of Saline Water, Department of the Interior, are publicly available.

Our biggest problem is getting the word to scientists and engineers about our resources. We use every reasonable means of public information to do it. While the Government prohibits our buying ads in magazines, editors have been generous with space. We often have feature articles in the trade, business and technical press, and news items on important individual reports. We have exhibits at industrial shows and conferences; we make speeches to scientific and professional societies, and we publish regular announcement journals—yet we still find many who do not know about our efforts.

A heat transfer specialist with a large chemical company discovered, in 1958, the wealth of material being released here each month. He told us that had he known about it previously, his firm would have saved 6-8 months' work which they had spent in preparing literature surveys. When he found what we had, he immediately bought a large number of AEC and other reports relating to heat transfer. Since then, he has been a regular user. The reports fill gaps in the company's knowledge and save much literature searching and research.

Another example, in metallurgy, is an illustration of savings which can be achieved by avoiding the duplication of research already done for a government purpose. This company, looking for a new process, bought two reports describing research at the Naval Research Laboratory. Those two reports saved the company about \$20,000 they would have spent in research, and with \$2000 to \$5000 worth of further engineering on their own they adapted the process to their needs.

How does a scientist or engineer go about keeping up with this wealth

COMMUNICATING RESEARCH RESULTS . . .

of information? The best way is through our regularly published announcement journal, *U. S. Government Research Reports*, which announces every report we place in our collection. This publication goes into the libraries of many companies, but it usually stays in the library and is not seen by the scientists and engineers. If your company is a subscriber to *U. S. Government Research Reports*, arrange to see it regularly.

Another successful method we use is to issue news releases to the technical, trade, and business press describing the most widely usable reports. The response from these releases is great. One limitation of the news release program is that we are able to cover only a few of the most widely usable reports out of some 1000 available monthly.

Each month, for small business, we select about 8-10 product and process reports in various fields of industry and describe them in detail in *Technical Reports Newsletter*, sold on subscription for \$1. a year through the Superintendent of Documents, Government Printing Office. For a small business whose staff limitations prohibit extensive examination and use of such a formidable publication as *U. S. Government Research Reports*, the *Technical Reports Newsletter* will bring to attention an occasional important report. We also publish abstracts of government-owned patents released for license to private industries. We plan to bring out these abstracts once a year. Our latest set is *Patent Abstract Series*, being released currently.

In 1958, the Congress gave OTS the money and authority to serve as a national "clearinghouse" for translations and information about translations. The emphasis has been on Russian literature, because that is the area in which it has been difficult to become informed. This program has a number of facets. First, OTS has made arrangements with U. S. Government agencies and friendly foreign governments doing translations for their own use to pass on to us a copy for reproduction and distribution to the public. Translations are sold at the cost of printing and handling.

Second, in cooperation with the Special Libraries Association, which collects translations from university and industry sources, we catalog and announce translations obtained through this source. Third, OTS will catalog and announce a translation available from any source, public or private, which informs us of the general availability of the translation. Fourth, we attempt to maintain a record of translations in progress so that anyone desiring to undertake a translation can check to find out if it is being done elsewhere and approximately when it will be available. (Success depends upon translators informing us of the work they are

undertaking. In general their cooperation has been good.) All these translations are announced in *Technical Translations*, which we publish twice a month. Subscription is \$12 a year from the Superintendent of Documents. (There is an extra \$4. for mailing to foreign addresses.)

New Program Developments: The most important is an extension of our work with ASTIA, which will double the number of military R & D reports available annually. The ASTIA is operated under the Department of Defense to provide copies of military research reports to DOD agencies and their contractors. Anyone else wanting military research reports gets them through us. We have worked out a system whereby we will get a copy of every report (except classified) collected from the Military by ASTIA. We will make these available to the public in either printed form or Xerox reproduction. Microfilms will be available if desired. The aid of ASTIA in augmenting our manpower by giving us the advantage of their acquisitioning and cataloging work is one thing that makes this expansion of our service possible.

The July 1 issue of *U. S. Government Research Reports* will reflect this increased volume. It will then be published twice a month instead of once a month. The new subscription price is \$15 a year, from the Superintendent of Documents. For foreign subscribers the price is \$18.50. Each issue should list and describe about 2500 reports.

We are starting a Comprehensive Literature Searching Service, in cooperation with the Science and Technology Division of the Library of Congress. A fee of \$8 an hour will be charged for literature searching. These searches will be "tailor made" to the specifications of the requestor. They can include searches of either or both the OTS Collection of Government reports and the Library of Congress collection of scientific and technical literature, and they can be conducted to the extent specified. Two types of searches are offered.

The first is The Current Awareness Bibliography Service, designed to keep the subscriber abreast of new literature on a periodic basis. The subscriber outlines the generic and specific subject fields and at intervals prescribed by him (such as one, two, or three months) he receives references to pertinent research reports, translations, periodical articles, technical papers, and other materials accumulated during the period.

The second is the Retrospective Bibliography Service through which the requestor is furnished a bibliography of material available at the time of the request and in accordance with literature dates and other limitations he specifies. Aside from the fee searching, we have in print some 200

bibliographies of Government Research Reports on subjects of wide interest, such as adhesives and abrasives, which sell for a few cents a copy. A list of these *Selective Bibliographies* may be had on request. If you write to us asking for the titles, prices, etc., of some recent reports in a particular field, we would provide that information without charge.

The third new program is the establishment of a national network of regional depository libraries to provide all areas of the nation with access to unclassified U. S. Government Research Reports. The OTS is undertaking this in conjunction with the Defense Department, the AEC, the NASA and particularly the National Science Foundation. In the past, OTS has established depositories in a few major libraries. The new system will establish 12 facilities, providing much more information, in Atlanta, Boston, Chicago, Dallas, Denver, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco, Seattle, and Washington, D.C. At these libraries you may consult copies of current technical reports on research in the physical, engineering, life and social sciences, and related bibliographic and reference publications. The OTS will provide over-all technical and management direction to this new depository system.

If your interests border on work done by the civilian agencies of government, such as the National Bureau of Standards or the U. S. Bureau of Mines, you should acquaint yourself with their journals. The Bureau of Standards for example, has a *Journal of Research* and a *Technical News Bulletin*.

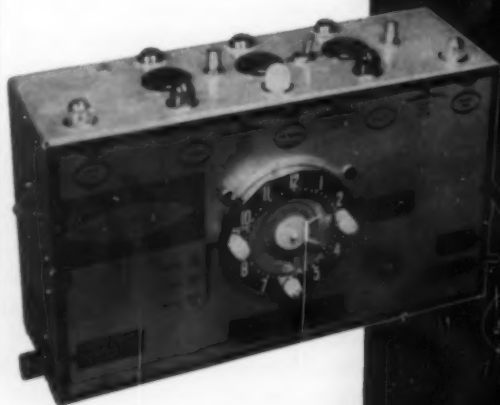
I hope that I have enlisted your interest in this source of knowledge which you as members of the great family of taxpayers have helped to create.

At the dedication of the new Somerville, Mass., regional office of Cenco's Central Scientific Co., Ralph C. Read, executive vice president, said that Russian scientists are "already working on drawing boards and in laboratories for such 21st Century wonders as airborne taxis, the harnessing of volcanos, nightless cities, and the adding of years to many human lives."

The Chemstrand Research Center, Inc., was dedicated at Durham, N. C., February 1. It has provision for 91 research laboratories, and is designed to accommodate 500 researchers.

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The Lost Chord of Science

Dr. William E. Hanford, Hon. AIC

Vice President for Research, Olin Mathieson Chemical Corp.,
460 Park Ave., New York 22, N. Y.

(Presented at the 38th Annual Meeting of the AIC, in Washington, D.C.,
May 11, 1961).

ONE of the greatest beauties which has been lost to man is "The Lost Chord." There may be some who will argue whether The Lost Chord is still lost, or whether it was as beautiful as legend has indicated. Regardless of how beautiful or harmonious it really was, it is a symbol of what happens when observations, impressions, ideas, and results are not properly recorded. The recording of man's ideas in writing, and the ability of others to read back and interpret, in the future, the ideas and concepts of the writer, has probably done more to advance man than any other single accomplishment. This is well-recognized in our education programs when we talk about the fundamentals of education—reading, writing, and arithmetic. The last of these is certainly secondary to the first two, for if you can't read and write you can't do arithmetic. It is obvious that these two functions of education are identical. It would be of no use to anyone if you could write and someone else could not read; it would be of no use to you if you could read and someone else couldn't write.

With scientific data there is another problem. After the information has been written you have to *find* it before you can read it. If we simply collect material and fail to record it in a fashion where it is permanently accessible to others, the data surely become "The Lost Chord of Science." The key words are "permanently accessible," by which I mean that the material must be well indexed and put in a form whereby one does not have to know it exists; or that the information is under some code name, such as "Manhattan Project," "Neptune," "Mohole," "Titan," "Nike Zeus"; or that the data are available from the Army, the Navy, the Air Corps, but not the Atomic Energy Commission or the Department of Public Health. As a chemist I am interested in integrating or adding up data from many areas. This is where we chemists differ from the machine. The word "accessible" to a research man has an element of time in it, for if you have an idea and want to check up on what others have done, you don't want to wait a week to take a 3-minute glance at the reference. I realize that I might have to wait 48 hours for the full article, but meanwhile I like to be able to look at a professional abstract to form some impression as to what I am going to see in the original article.

It is easier for me to say that Government R & D results must be permanently accessible than it is to devise a system to make them so. The reason this problem is so difficult with Government R & D is that the program is so big. It is reported that the Government will spend \$9-billion during the next fiscal year on research, development and engineering.

The problem is what must be done so that the results of a \$9-billion expenditure per year by the Government can be put in a form so that the expenditure is useful to the welfare of mankind. Now \$9-billion is a figure beyond my comprehension, but in industry we figure that it costs about \$30,000 per year to keep a scientist working in an average research laboratory. This means that the \$9-billion is equivalent to 300,000 scientists working full time. This great number of people can produce a previously uncomprehended volume of scientific literature. If we assume that only 10% of the scientists are productive, this means there are 30,000 scientists producing worthwhile publishable results. If each of these scientists published one paper a year of 5 pages each, this would represent 150,000 pages of scientific material. *The Journal of the American Chemical Society*, in its 80th Volume, published in 1958, contained 6,776 pages. Thus 150,000 pages would be equivalent to 22 years of ACS publications. This rough calculation gives some idea of the tremendous quantity of information which might be lost, if some means are not provided to make the results permanently accessible to all scientists.

The two preceding papers* outline what is being done in an attempt to solve this difficult problem through publication of lists of titles of reports available, as well as pamphlets, even books, dealing with Government research. Now material contained in reports, pamphlets and books is all right when one wishes to review broadly a subject or to study the art in a given area. But books in general are not given the same place in our permanently accessible files as is the so-called scientific literature. Surveys indicate that about half of the unclassified technical information available in Government reports is published within two years. This is good, but not good enough. It means that we are running in low gear. Not only is the percentage low but the time is long, especially in fast moving fields. It is easy to criticize, but I have a few concrete suggestions to solve this problem:

1. The Government in its contract work should allocate funds for the preparation, and pay for the publication, of its results in some top standard scientific journal. Our entire science is built on the international exchange of information and ideas. The basis for all science is to improve

*See preceding articles in this issue of *THE CHEMIST*.

the well-being of mankind. When we are spending the people's money to advance their protection or health, we should be even more desirous of making this information available to other scientists. In the case of industry there is some reason for being "tight" with scientific information because the stockholders pay for it, and you like to give them an economic advantage for their investment in industrial research. Even in the case of industry we are severely criticized for not publishing more of our results at a faster rate. Industry has come to realize that it cannot expect up-to-the-minute students from our universities unless we give them some information about what we have found in our industrial research. The Government research results belong to the public and therefore must be made available to all.

2. Because the Government, through the U. S. Patent system, gives an inventor a monopoly for making our results available to fellow scientists, this represents another avenue for industry to inform the world as to what it has accomplished. All scientists, academic and industrial, recognize that the U. S. Patents represent a tremendous reservoir of scientific information, and today *Chemical Abstracts* is doing a remarkably thorough job abstracting U. S. and foreign patents. Therefore, the Government research results should be patented regardless of what action is taken as to who owns them, purely from the point of view that by filing patents the information is put into a file where it can be obtained. It is permanently accessible.

The preparation of scientific data for publication is just as important a part of the expense as is the collection of the data, because in preparing information for publication one has to demonstrate how the information fits into previously published information, and also present some theoretical explanations for the observed facts. These two exercises often show up limitations in work done for purely industrial or Government purposes. Because of the great volume of work being turned out by Government-paid scientists in their own laboratories or under contract, it is not possible to absorb this quantity of material into our present publication system, which is essentially paid for by the scientist himself through the purchase of the journals. Scientific journals do not carry advertising, so there is no other means of support except the sale of the journal to the scientists that use them. This system of the scientist paying for the books is outmoded. I think we should still pay for them to a limited extent, but not entirely. This same limitation has been recognized by *Chemical Abstracts*. They now have two prices for this important journal, (1) for individual use, and (2) for industrial or library use.

I would propose that for research done by Government or under Government contracts a charge be made for each article published in the journal. Similarly, a charge should be made for each abstract published in a top-ranking abstracting journal, such as *Chemical Abstracts* or *Nuclear Abstracts*. Many of my scientific friends may not like the idea of losing control over their scientific journals by having people, especially the Government, pay for space in these valuable publications. I do not infer that because the articles are paid for, the same high editorial policy should not prevail. Present research, Government, industrial, or academic, has become such big business that the scientists can no longer pay the full cost of publication.

There is an alternate to this proposal which would be satisfactory to me and that is that the Government, in its various branches of research, set up its own journal having the same high standards as the other scientific journals. The Government has been doing this for many years by the publication of papers by the National Bureau of Standards. Their's is a top-notch journal containing only papers published by illustrious research institutes, and it carries the same prestige as that of any other scientific publication. If the Government would set up its own journal, it should be made available to libraries and scientists at some reasonable cost. The publication of information in this form would go a long way to shortening the time it now takes to get reports from the Government files. I feel that this system is perfectly feasible, operationally and financially and would do a great deal to put our scientific work in the forefront. It is up to the American chemists, physicists, and engineers to impress upon the Government its great responsibility in making the results of its research investigations permanently accessible to scientists. Unless this is done we will lose more than we gain, and we will truly have "The Lost Chord of Science."

Unless the Government sets up some new mechanism, such as one of the two outlined above, we will lose a lot of valuable scientific information if Government contractors do not seek U. S. patents. There is much technical information now published through this system. I am not worried about what is done about royalties, rights to the patents, etc., I simply would hate to see this source of technical information dry up until some means has been found to replace this type of publication.

Some of the critics of Government research may feel that a large amount of the work is not good enough to publish. If this is so, then I would say that it is not good enough to spend the tax-payers' money in

THE LOST CHORD OF SCIENCE

collecting the data. Unless we are going to get information on which to build for the future, why spend the dough?

I think it is time for THE AMERICAN INSTITUTE OF CHEMISTS, as the leading professional society in the United States, to get behind a move to see that more Government unclassified research results are published at a faster rate and in a form so that they will be permanently accessible, and that classified research results are declassified and published as quickly as possible. In the case of classified information, the data should be written up in a form ready for publication so that as soon as it is declassified it will be available to all scientists. Old work never gets written up for publication. I firmly believe that the Government should pay for this as a part of the research and should not treat the publication of data as a poor relation. Let's make it a member of the entire family. Let's make sure that the valuable work supported by tax-payers' money does not become the Lost Chord of Science.


Dr. Kenneth W. Newman, F.A.I.C., has been appointed director of sales engineering, a new executive position of the Nuclear Corporation of America, Denville, N. J. He has been general manager of Isotopes Specialties Company, a division, in Burbank, Calif.

Dr. Lloyd A. Hall, Hon. AIC, was recently elected to the Executive Board, United Nations Association of Los Angeles, Calif., and to the Boards of Directors of the Pasadena Chamber of Commerce and the Pasadena Beautiful Foundation, Inc., at Pasadena, Calif.

Nathan H. Nash, F.A.I.C., formerly with Lanco Products Corp., New York 1, N. Y., is now director of new products development & marketing of Basic Foods Sales Corp., 53 Bancker St., Englewood, N. J.

Dr. Henry B. Hass, F.A.I.C., is now the director of chemical research for M. W. Kellogg Co. of New York, N. Y.

Dr. Lee S. Harrow, F.A.I.C., has been appointed director of research and development for A.S.R. Products Co., a division of Philip Morris Inc., Richmond, Va. Dr. Harrow is chairman of the Virginia AIC Chapter.

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College Chemistry Teacher for co-educational, liberal arts college in West Virginia. Dept. of Chemistry, approved by ACS, is conducting Chemistry for Industry Conferences and a Science Teachers Workshop. Salary range dependent upon qualifications from \$5,000 up. Box 61, THE CHEMIST.

The Chemicals and Dyestuffs Division of Koppers Company, Inc., Pittsburgh 19, Pa., recently announced a complete line of dyestuffs designed especially for polyester fibers. The new Amacron dyes, in 14 popular colors, have complete affinity with polyester fibers and are fast to light, washing, crocking, sublimation, and perspiration.

Western Biochemical Corporation, 755 Sansome St., San Francisco 11, Calif., recently announced that it is the exclusive sales agent for amylase, protease and lipase enzymes produced by a new, low-cost process, by Pacific Laboratories, Inc., of Honolulu. The new process was developed by a Japanese biochemist, Dr. Toyosaku Minagawa, and his associate Takashi Hamaishi. Because of their stability and exceptionally high activity and purity, Pacific enzymes are expected to have applications in medical research, pharmaceutical preparations, and new techniques for the utilization of fibers and wood waste, in addition to uses in the food, detergent, cosmetics, and other industries.

A new research data firm, Technical Aid Service, Inc., 1500 W. 3rd Ave., Columbus 12, Ohio, offers technical literature digests prepared on subjects of client interest. Request information from the company.

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The Research Revolution

Dr. Leonard S. Silk

Senior Editor, *Business Week*, New York, N. Y.

(Presented at the 38th Annual Meeting of the AIC, Washington, D.C., May 11, 1961)

THE most striking development of our time is the explosion and diffusion of scientific and technological knowledge. Progress in the laboratories and in the factories and at the test sites is putting this nation's and the world's political, economic, and social institutions through a radical transformation—stimulating vast population growth; raising income levels; altering the class structure of societies and the relative power relations among nations; rendering obsolete the old skills of mankind and demanding higher intellectual capabilities of growing numbers of people; changing capital and resource requirements; producing booms in some regions, distress in others; revolutionizing the art of war; opening up a new age of exploration in which man pushes out from his own planet and begins experimentally to investigate the cosmos.

It is extremely difficult, almost impossible, to feel that one sees the implications of this research revolution in true perspective. "What a beautiful sight!" said Commander Shepard, when his flight plan called for him to look through the periscope of the Freedom 7 at the earth below. Was anyone moved to say "What a beautiful sight" when the mushroom cloud rose over Hiroshima, but that, too, was a product of our research revolution.

It is a revolution whose dimensions are extremely hard to measure. We have grown accustomed to figures that plot the rise of research and development expenditures in our own country. Thirty years ago, we were spending less than \$100-million on R & D. In 1959 we spent \$12.4-billion on R & D. Admittedly, those numbers need to be deflated for price changes and for differences in definition of what industry classifies as research and development. One economist concludes that the actual increase in R & D spending has not been 6000% since 1930 but only about 3000%.¹ If one made full allowance for the increasing productivity of researchers and research equipment—the speed of the modern electronic computer, say, compared to the old hand-cranked calculating machine—I wonder whether the true increase might not swing back closer to the 6000% figure.

Dollar data can be terribly misleading, as we economists make a career of saying. Let us consider some other types of measures of the size of this research revolution. Prof. Nicholas D. Cheronis, editor of the

(1) D. Novick, "What Do We Mean by Research and Development?" *California Management Review*, pp. 9-24, Spring, 1960.

Microchemical Journal—who fears that we are suffering from the ancient Greek disease of *polygnosia*, or too much knowledge—has pointed out that the conscientious chemist is faced with the task of reading 4500 pages from journals and abstracts each month. But the conscientious chemist has an easy time of it, as Sidney Hertzberg has noted,² compared with the conscientious general scientist, whoever he might be. For, according to the President's Science Advisory Committee, about 50,000 scientific and technical journals are published throughout the world, and they contain every year about 1,200,000 articles of significance. And the trend is upward. Prof. Gerald Horton of Harvard estimates that, 20 years from now, there will be twice as much to read. I have not examined Prof. Horton's evidence for his projection, but my own, based on the height of the pile of papers on my own desk, is that the volume of reading matter in my business is doubling every two years.

Long gone are the days when a man could feel that he was well on the way to a liberal education when he had begun to work his way through Dr. Eliot's Five-Foot Shelf of Harvard Classics. Now Grayson Kirk, president of Columbia University, reports that his university's library must add one and half miles of shelves for new material each year—7820 feet per annum.

Nevertheless, this research revolution is not without its skeptics. Some note that the bulk of R & D spending is actually done by only a few industries. Of the \$10,477,100,000 which U. S. industry is planning to spend on R & D in 1961,³ the aircraft industry will spend \$3.7-billion, the electrical equipment industry will spend slightly more than \$2-billion, the chemical industry will spend \$785-million, machinery \$719-million, professional and scientific instruments \$467-million, petroleum products \$319-million, and the rest, it is said, consists of dribs and drabs. Admittedly, the six industries I have named will spend about 3/4 of the total R & D outlay planned by U. S. industry this year. The implication some would draw from this fact is that the R & D wave is extremely narrowly limited and, in a sense, almost a phoney. The wave would be real, these skeptics apparently believe, if all industries spent heavily and equally on R & D.

This seems to make very little sense. Prof. Simon Kuznets, one of our foremost students of the history of economic development, has noted the tendency for scientific discovery, invention, and innovation to be concentrated at a given time in a few fields, rather than evenly distributed among

(2) Sidney Hertzberg, *Current*, September, 1960, p. 1.

(3) McGraw-Hill Capital Spending Survey, *Business Week*, April 29, 1961, pp. 32-34.

THE RESEARCH REVOLUTION

all.⁴ During the first industrial revolution of the late 18th and early 19th centuries, it was the iron, stationary steam, and the cotton textile industries that were the focus of much of the inventing and innovating. In the late 19th century, innovational efforts were concentrated upon electric power and communication, and then the internal combustion engine. Kuznets suggests that, now in the mid-20th century, the stress is being put upon atomic energy, with the steam era well in the past, and the electricity era coming to an end as a field for major discovery, invention, or innovation. But, as I have elsewhere argued,⁵ it seems to me far too narrow to call it the age of automation or cybernetics, as Norbert Weiner did. And it's more than the space age. We are looking not only out into space, but deep within our world, even within ourselves. I prefer to call this the age of research, however vague or general the term may be. We are moving forward on the strength of research in nuclear and solid-state physics, organic and inorganic chemistry, electronics, engineering, the earth sciences, the biological sciences, mathematics.

Within industry, progress is not, and obviously cannot be expected to be, uniform in all fields. Areas of concentration, as in the past, will go on shifting from field to field. For, as Kuznets observes, the available intellectual and material resources are never sufficient for the pursuit of knowledge, invention, or innovation in all possible fields with equal vigor—some choice must be made of the more promising areas. And, at any given time, only a few areas are most promising. The chances of pushing forward with new inventions and innovations in older growth areas is limited by the very successes of the past—and some very new areas may not be quite ripe for successful invention and innovation.⁶ Although the route to successful industrial innovation is not an orderly or regular one, and some innovations have in the past preceded scientific understanding of what made them work, it grows increasingly true that the limiting factor on further industrial advance is our basic scientific knowledge. I am inclined to agree with those that maintain that, if there is a basic flaw in our present American R & D effort, it is that we have emphasized applied research and development at the expense of basic research—particularly the expense measured not simply by the diversion of dollars, but more importantly by the diversion of human talents and time from basic to applied work.

(4) Simon Kuznets, *Six Lectures on Economic Growth*, The Free Press, Glencoe, Illinois, 1959, pp. 32-33.

(5) L. Silk, *The Research Revolution*, McGraw-Hill Book Co., New York, 1960, pp. 39-59.

(6) Kuznets, *op. cit.*, pp. 32-33.

There has, in fact, been a small reduction in the share of total R & D outlays going for basic research since the end of the war. In 1945, 10% of the total went for basic research, and in 1946 this figure rose to 11%. The proportion of spending on basic research has gradually slipped down to 8%—and again critics of our U. S. research effort have made much of this. Nevertheless, it is well to remember that, in absolute terms, there has been a 5-fold increase in spending on basic research since the last year of the war, and a 4-fold increase since 1946. In 1945, total spending by all institutions—government, industry, and the universities—on basic research amounted to \$180-million; in 1946, the figure was \$240-million. Last year, spending on basic research reached \$1-billion, and this figure promises to treble in the next decade. U. S. industry is likely to contribute increasingly heavily to the basic research output, as appreciation of the essentiality of expanding fundamental knowledge grows in the upper reaches of management. I know of one major manufacturer of business machines that will be spending over \$25-million on basic research next year—more than a fourth of its total American R & D outlays.

Another form that skepticism about the genuineness of the research revolution takes is to emphasize the heavy dependence of R & D upon government financing. The skeptics note that 55% of the funds for financing all R & D activity during the 1950's came from the federal government and that most of these expenditures were for defense purposes. "These figures," Prof. Daniel Hamberg writes, "are in marked contrast with those of earlier years. In 1930 the federal government financed only 14% of total R & D activity, whereas private industry paid for some 70% and nonprofit institutions for the remainder."⁷ The greatly increased role of government in financing R & D, Hamberg suggests must have changed the patterns of incentives and controls germane to inventive activity: "Whereas the bulk of industrial R & D used to be distinctly profit-oriented, and under the influence of the patent system and other social controls, much of it is now strongly influenced by political and defense considerations."⁸

While a considerable shift has obviously occurred from R & D motivated by commercial considerations toward R & D motivated by political or defense objectives, the degree of the shift should not be exaggerated. A recent McGraw-Hill survey found that, among all manufacturing industries, 57% of R & D spending is for commercial products, 43% for military products. And, if the aircraft industry is excluded from the

(7) D. Hamberg, "Less Noise, More Research," *Challenge*, May 1961, pp. 11-17.

(8) *Ibid.*, p. 17.

THE RESEARCH REVOLUTION

figures, 84% of R & D spending by U. S. industry is for commercial products. In the chemical industry, for instance, 97% of R & D expenditures are for the development of commercial products.

But, even if the proportion of industrial R & D being done under military or other government contract were even greater than it is, and the proportion is certainly large, this would not imply any phoniness about the research effort. Is atomic energy any the less significant because its development was heavily supported by government funds? Is radar? Are jet aircraft? Will the communications satellites of tomorrow not contribute to the growth of the economy and the stitching together of the globe? Though the original motivation for these tremendous technological developments was political or military, their economic consequences will still be profound.

Indeed, if I may offer an anti-Marxian theory of economic development, I should suggest that most of the really great economic movements in history have been motivated by political, military, religious, and other non-economic causes. This was essentially true of the Crusades of the middle ages that opened up trade with the East and helped to launch the great city states and to break up the atomistic world of feudalism, just as the coming of feudalism itself resulted not from economic causes but from inner cultural decay and outside military aggression from the barbarians.

Our world is again experiencing one of those desperate political struggles that appears certain to work tremendous changes upon civilization as we have known it. Fundamentally, I see this struggle less as a conflict over economic issues than as one between rival political philosophies—a struggle between the nations that believe in freedom and those who are determined to achieve power through systems that use tyranny in the most sophisticated, thorough, and competent way that it has ever been employed. This struggle between political and personal philosophies is occurring in the midst of this vast scientific and technological revolution of our time; and the nation that proves itself to be master of the scientific and technological revolution will emerge as the winner of the political struggle as well.

This competition is putting the greatest possible demands on the creative powers of the participants in the struggle. As Jean Monnet put it recently:

In the new scientific and industrial revolution in which the world is now engaged, human factors—genius, imagination, technological ingenuity—are going to play the preponderant role which belonged to natural resources during the last century.

Political and military competition may not be the best of reasons for putting forth a magnificent research effort. But they are the reasons that exist. And if we fail to measure up to the scientific and technological challenges of our time, it is unlikely that we will survive as a free and independent people.

Dr. Ray P. Dinsmore, Hon. AIC, retired May first as vice president of the Goodyear Tire & Rubber Company, Akron, Ohio. He will serve Goodyear as a consultant on research and development projects.

Dr. Walter S. Guthmann, F.A.I.C., will join the faculty of Roosevelt University, Chicago, Ill., September 1, as associate professor of chemistry. He is currently with Morton Chemical Co., Chicago.

Cyril S. Kimball, F.A.I.C., has been elected president of Foster D. Snell, Inc., New York 11, N. Y. **Dr. Foster D. Snell**, Hon. AIC, will continue as chairman of the Board. Mr. Kimball has served as executive vice president since 1953.

Dr. L. Patrick Moore, F.A.I.C., has been elected president of Arizona Chemical Company, effective July 1. Arizona is a joint venture of American Cyanamid Co. and International Paper Co.

Kenneth H. Klipstein, F.A.I.C., is now president of American Cyanamid Company, New York, N. Y. Wilbur G. Malcolm, former president, is now board chairman and chief executive officer. Mr. Klipstein joined Cyanamid in 1924, after receiving the M.A. degree from Princeton.

Dr. Norman G. Gaylord, F.A.I.C., has organized Gaylord Associates, Inc., New Providence, N. J., to carry out contract laboratory research in the organic and polymer fields. He was formerly vice president, research & development, Polymer Division, The Western Petrochemical Corporation.

Dr. Lloyd H. Reyerson, F.A.I.C., professor of chemistry at the University of Minnesota, Minneapolis, Minn., retires at the close of the academic year after 42 years of service. A special meeting to honor him was held June 1 by the Minnesota Section of the American Chemical Society, in recognition of his many services to the Society.

Dr. Benno Lowy, F.A.I.C., announces that the Pacific Chemical Laboratories, Inc., which he heads, has moved to larger quarters at 41 Drumm St., San Francisco, Calif.

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Our 38th Annual Meeting

THE Washington Chapter was the gracious host for an outstandingly successful Annual Meeting, held May 11-12, at the Statler-Hilton Hotel, Washington, D.C. The attendance was excellent; the program lively and extremely informative.

The first professional session, May 11, was on "Washington, the Science Information Center of the Nation," presided over by Mr. C. Dake Gull, consulting analyst, Information Processing, Defense Systems Department, General Electric Company.

Dr. Burton W. Adkinson spoke on "Chemical Information and the Role of the National Science Foundation." He was followed by Mr. John C. Green, whose subject was "Communicating Research Results to Science and Industry." Dr. William E. Hanford, Hon. AIC, spoke on ways in which industry might be kept informed on the volume of information generated by government research and development, and he titled his paper, "The Lost Chord of Science." (Read these papers in this issue of *THE CHEMIST*.)

At luncheon, Dr. Richard L. Kenyon, F.A.I.C., editorial director, Applied Publications, the American Chemical Society, presided. Dr. Leonard S. Silk spoke on "The Research Revolution." (See this issue.) A tour of the Patent Office occupied the afternoon. Greetings were extended by the Hon. David L. Ladd, Commissioner of Patents. The Hon. Maurice A. Crews, assistant commissioner of patents, discussed "Patents and the Patent Office as a Source of Technical Information."

The Gold Medal Banquet

In the evening of May 11, the Gold Medal was presented to Dr. Alden H. Emery, executive secretary, American Chemical Society. The banquet was preceded by a reception through the courtesy of members of the Board of Directors and the senior staff at headquarters of the American Chemical Society. Dr. Milton Harris, retiring AIC president, presided at the dinner.

Dr. Ralph Connor, chairman of the Board, Rohm & Haas Corp., Philadelphia, Pa., presented Dr. Emery with a souvenir book, picturing real and fanciful incidents in Dr. Emery's life. In conclusion Dr. Connor said,

This night, we attended a dinner at which Alden H. Emery was awarded the AIC Gold Medal. Some came who were not acquainted with him but who wanted to honor him for his contributions to chemistry; others who came were his friends and wanted to express their pride in his achieve-

ments and in this recognition of them. All of us wanted to show our appreciation of a career which, directly or indirectly, has helped everyone associated with chemistry. We attempted not to be sentimental but to make this a happy and friendly evening in which by our acts rather than words we made Alden feel our affection, our respect and our appreciation. These and our best wishes for the future we gave to him and his fine family.

Dr. Henry B. Hass, chairman of the AIC Committee on Gold Medal Award, presented Dr. Emery with the Gold Medal and the certificate of Honorary AIC Membership which bears the citation:

To Alden H. Emery

whose administration of the office of executive secretary of the American Chemical Society is outstanding for intelligence, tact, vision, and responsiveness to the desires of its members.

Dr. Emery accepted the Medal with an address on "The Road to Professional Status," which is featured in this issue of THE CHEMIST. He concluded his address with the gracious remarks:

... The medal is beautiful and valuable. But, more important to me is the significance. Possessions of the heart are just as precious and sacred as more tangible goods and properties, maybe more so. There is nothing in life that gives one more personal satisfaction than to live in accordance with his ideals. This I have tried to do. It is an added and valued dividend to have others say, in effect, Well done.

The Quality and Supply of Chemists

The third Professional session, held Friday, May 12, had as its theme, "Steps Being Taken in Washington to Improve the Quality and Supply of Chemists." Dr. Johan Bjorksten, incoming AIC president, presided. Dr. B. R. Stanerson, F.A.I.C., deputy executive secretary of the ACS, presented statistics on "The Ten Most Wanted Chemists." Dr. Keith R. Kelson, deputy assistant director, Scientific Personnel and Education, National Science Foundation, described "The National Science Foundation Education Programs in Chemistry."

A lively debate then took place between Senator Russell B. Long (Louisiana), chairman of the Monopoly Subcommittee of the Senate Select Committee on Small Business, and Dr. Roger H. Lueck, vice president for research, American Can Company, on "Should the Federal Government Have Proprietary Rights in and Title to Patents Originating in R & D Contracts Financed by Federal Agencies?" Dean Arthur E. Burns, dean, Graduate Council and professor of economics, George Washington University, acted as moderator. Senator Long excelled as a superb master of dramatic appeal while Dr. Lueck excelled as the methodical master of scientific facts.

Dr. Milton Harris presided at the luncheon which followed. The

The Medalist and Some of His Friends

(Pictures taken by Dr. Donald B. Keyes, F.A.I.C.,
at the Gold Medal Banquet, May 11, 1961)



speaker was the Hon. Richard S. Morse, assistant secretary of the Army (Research & Development), U. S. Department of the Army. His subject was the "Impact of the Federal Scientific Research Program on Technological Progress."

In the afternoon, the 38th Annual AIC Business meeting was held. Here Committee and Chapter reports were presented, recounting the highlights of the year's activities.

In Appreciation

Our Annual Meeting Committees deserve the deep appreciation of the AIC for their fine work in organizing the myriad details involved in a meeting such as this. The chairmen of these committees were:

General Chairman and Program Chairman: Dr. Clem O. Miller, National Academy of Sciences-NRC
Arrangements, Dr. Alex P. Mathers, Internal Revenue Service
Finance, Robert C. Watson, Internal Revenue Service
Ladies Program, Mrs. Madeline B. Henderson, National Science Foundation
Public Relations and Publicity, Dr. Carl J. Wessel, National Academy of Sciences-NRC
Registration, Paul E. Reichardt, Washington Gas Light Company

Milton E. Parker, F.A.I.C., resigning as professor of food engineering of Illinois Institute of Technology, June 15, is continuing his consulting practice, specializing in caloric density control of foods, and radioactive contamination studies of foods. His office is Room 1125, 135 South LaSalle St., Chicago 3, Ill. On May 19, the Alumni Association of Illinois Institute of Technology presented him with a special citation as counselor and teacher.

Dr. Wilbur A. Lazier, F.A.I.C., has been elected senior vice president in charge of engineering and a member of the board of directors of the Sprague Electric Co., North Adams, Mass. He has been vice president and technical director since 1953.

Dr. Gus A. Ropp, F.A.I.C., has been transferred from Union Carbide Nuclear Co. at Oak Ridge, Tenn., to Union Carbide Consumer Products Co., Cleveland (Parma), Ohio.

John F. Anthes, F.A.I.C., has retired from the Brooklyn Union Gas Co. His address is 58 Wyatt Road, Garden City, N. Y.

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ABOUT AIC MEMBERS

W. J. Sweeney, F.A.I.C., vice president, Esso Research & Engineering Co., Linden, N. J., was presented the Certificate of Appreciation of the American Petroleum Institute, May 10, in Houston, Texas, at the mid-year meeting of the API Division of Refining. The certificate cited long and valued service to the API and the oil industry.

Dr. A. Ernest MacGee, F.A.I.C., former chairman of the Midwest AIC Chapter, recently retired as commander of the Naval Reserve Petroleum Company 9-2, after 20 years of service.

Dr. Robert J. Feeney, F.A.I.C., has been appointed director of commercial development of Chas. Pfizer & Co., Inc., New York 17, N. Y. He joined Pfizer in 1950 as research chemist.

Dr. Robert E. Conary, F.A.I.C., is attending the School of Industrial Management of Massachusetts Institute of Technology, Cambridge, Mass. **Mildred Hunt, F.A.I.C.**, is completing his term as secretary of the New York AIC Chapter.

Dr. Souren Z. Avedikian, F.A.I.C., research director, The Lummus Co., New York, N. Y., was a guest panelist on "What's New in Package Plants," at the spring symposium of the Association of Consulting Chemists & Chemical Engineers, Inc., April 25, in New York, N. Y.

Dr. Gilbert Small, Jr., F.A.I.C., is now manager of research on materials, Paper & Plastics Div., Ludlow Corp., Needham Heights, Mass.

Dr. Foster D. Snell, Hon. AIC, chairman of the board of Foster D. Snell, Inc., New York 11, N. Y., has been re-elected president of the Graduate Faculties Alumni of Columbia to serve until June 30, 1962.

Dr. Charles N. Frey, F.A.I.C., lecturer at Columbia University and Massachusetts Institute of Technology, has been made an Honorary Member of the American Association of Cereal Chemists.

Arthur Wilfond, A.A.I.C., has left the U. S. Patent Office, Washington, D.C., and is now with Curt M. Avery, patent attorneys, 501 5th Ave., New York 17, N. Y.

Cyrus G. Dunkle, F.A.I.C., is now staff specialist in ordnance, Weapons Systems Division, The Martin Co., Baltimore 3, Maryland. He was formerly at Picatinny Arsenal, Dover, New Jersey.

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Dr. A. C. Zettlemoyer, F.A.I.C., distinguished professor of chemistry, Lehigh University, Bethlehem, Pa., urges research-minded technical men in the chemical industries to broaden their spheres of knowledge through advanced study. Prospective candidates interested in pursuing courses of study and research leading to M.S. and doctorate degrees are requested to contact Dr. Zettlemoyer for information about the fellowships and graduate assistantships available.

W. A. Hammond, F.A.I.C., president of the W. A. Hammond Drierite Co., Xenia, Ohio, is president of the Greene County Board of Health, and was recently elected president of the Richard Montgomery Chapter (Dayton area) of the Sons of the American Revolution.

Dr. Helmut R. R. Wakeham, F.A.I.C., has been elected vice president of Philip Morris Inc. He is also director of research and development at the Philip Morris Research Center in Richmond, Va.

Dr. Karol J. Mysels, F.A.I.C., professor of chemistry, University of Southern California, was chosen to give the 1962 research lecture for the USC Graduate School. He will speak on "Soap Bubbles in Three Centuries of Scientific Research." Recently he was appointed to the advisory board of the *ACS Journal of Physical Chemistry*.

Dr. Ernest M. Weber, F.A.I.C., has been elected vice president, research and development, of Chas. Pfizer & Co., Inc., New York, N. Y. **Dr. G. M. Shull, F.A.I.C.**, was promoted to director of fermentation research.

Dr. C. M. Doede, F.A.I.C., president, Quantum, Inc., Wallingford, Conn., announced that the research laboratory has produced a rubber that is slippery and yet retains the elasticity of the natural or synthetic materials. Its significance is that a new approach to the production of seals for precision mechanisms is made feasible.

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ABOUT AIC MEMBERS

The U. S. Stoneware Co. of Akron, Ohio, has purchased the Chemical Equipment Department of the General Ceramics Div., of Indiana General Corp. **Howard Farkas**, F.A.I.C., is vice president and general sales manager of U. S. Stoneware.

Prof. James W. Perry, Hon. AIC, of the University of Arizona, Tucson, will speak at the 4th annual Institute in Technical & Industrial Communications, July 10-14, at Colorado State University, Ft. Collins, Colorado.

Martin B. Williams, F.A.I.C., of the Army Rocket & Guided Missile Agency, Redstone Arsenal, Ala., was appointed coordinator for the 17th Annual Meeting of the joint Army-Navy-Air Force-ARPA-NASA, Solid Propellant Groups, held May 23-25 at the Shirley-Savoy Hotel, Denver, Colorado. The Army was host for the meeting.

Dr. Walter J. Podbielniak, F.A.I.C., president of Podbielniak Inc., a division of Dresser Industries, Inc., Chicago 11, Ill., announces that William D. Kohlins has joined the company as vice president in charge of operations.

Dr. Lorna T. Sniegowski, A.A.-I.C., as Lorna Tregoning, was a student medalist of the New Jersey AIC Chapter in 1955. She has since married Paul J. Sniegowski, and has received the Ph.D. in chemistry from the University of Maryland.

Dr. Rudy H. Ellinger, F.A.I.C., has been appointed to the staff of Durkee Famous Foods' Technical Service Laboratory, Chicago, Ill. He was formerly with J. D. Jewell, Inc., Gainesville, Ga.

Stepan Chemical Co., Northfield, Ill., announced recently that it will manufacture the "anti-knock" gasoline additives, tetraethyl lead and tetramethyl lead. Alfred C. Stepan, Jr., president, said the company has entered into a working agreement with Societa Lavorazioni Organiche Inorganiche of Trento, Italy, and has commitments for the purchase of "a substantial amount" of planned production.



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Number of Research Scientists Increasing

(Reprinted from Chemical News, published by the
Manufacturing Chemists' Association, Inc.)

SCIENTISTS and engineers engaged in chemical industry research have more than doubled in the past nine years. Now estimated by the National Science Foundation at approximately 34,000, as of Jan. 1959, only 15,632 were employed in 1950, according to a survey by the National Research Council. At the same time the number of research technicians has grown at nearly the same rate—16,941 in 1950 compared to 34,400 today.

The chemical industry has long led all other manufacturing industry in the proportion of employees engaged in research. For every 10,000 production workers, the industry employs 661 research workers as against 215 for all manufacturing industry. As a per cent of total employment, the industry research scientists and engineers accounted for 9%, exceeded only by the aircraft industry with 10.7%.

However, some manufacturing industries, of which aircraft is an example, rely on a substantial share of government funds to help finance their research programs. Privately financed research and development expenditures by the chemical industry are estimated at \$678 million for 1959, making it the highest of any U. S. industry. Representative chemical companies currently appropriate three to four per cent of their annual sales for research.

Broken down by category, the chemical industry, as of January 1959, employed 36,600 engineers, 31,100 chemists, 4,200 medical scientists, 3,900 biological scientists, 1,600 agricultural scientists, 1,200 physicists, 700 metallurgists, 600 mathematicians, 300 geologists and geophysicists, and 3000 other scientists.

Professional Appointments

June 6, 1961. Niagara Falls, N. Y.

Meeting of Niagara Chapter. Student medals will be presented. Place, subject and speaker to be announced. For information, Prof. Howard W. Post, Chapter Secretary, Chemistry Department, University of Buffalo, Buffalo 14, N. Y.

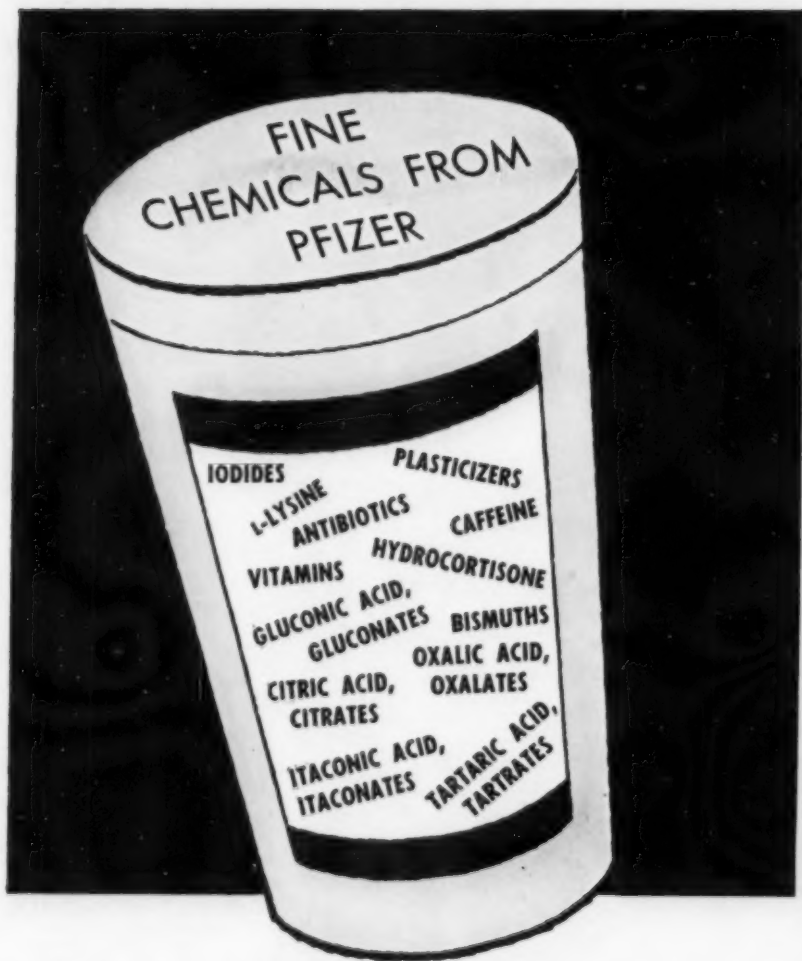
June 21, 1961. Chicago, Ill.

Beaubien Room. Meeting of Chicago Chapter. Speaker, Dr. A. Allan Bates, Portland Cement Association. For information: Miss Helen Selin, Chapter Secretary, 6916 N. Wayne Ave., Chicago 26, Ill.

May 10-11, 1962. Chicago, Ill. Edgewater Beach Hotel. The 39th AIC An-

nual Meeting. The Chicago AIC Chapter will be our host.

The Midwest Feed Manufacturers' Association will hold its Centennial Nutrition Conference at the Hotel Muehlebach, Kansas City, Mo., Oct. 21-25, 1961. Exhibits devoted to nutrition in humans and animals and careers in agriculture will highlight the Conference. For information write the Association at 20 West 9th St., Kansas City 5, Mo.



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